

UC-NRLF

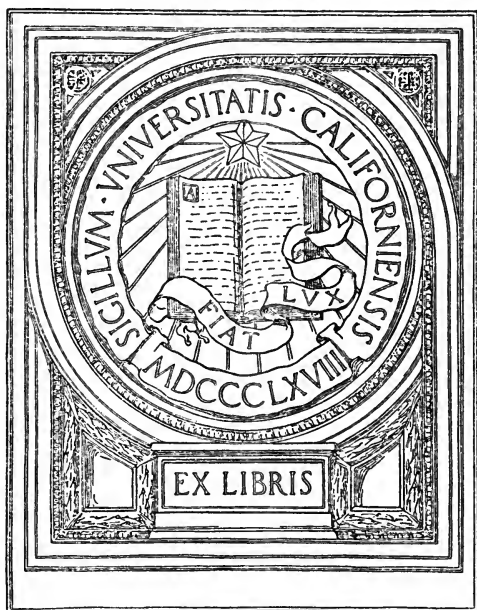


B 3 021 143

1. Breech Mechanism Service
Sea Coast Cannon.
2. Crusher Gauges for Cannon.
3. Colt Automatic Gun(Cal..30.)
4. 5"and 6" R.F. Guns.
5. 6" Disappearing Carriage.
6. 6" Armstrong R.F. Gun.
7. 4.7" Armstrong Gun B.L.R.
8. 4.7" Armstrong R.F. Gun.
9. 4.7" Armstrong 45 Calibers
R.F. Gun, Pedestal Mount.

W. C. Davis

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W. C. Davis



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CRUSHER GAUGES FOR CANNON.

(SIX PLATES.)

The gauges are of two kinds, fixed and internal, each kind being made in two sizes, large and small.

FIXED CRUSHER GAUGE (LARGE)—PLATE I.

Parts.—1. The housing (*a*). 2. Closing screw cap (*g*). 3. The piston (*b*). 4. Cylinder holder (*d*). 5. Copper washer (*c*). 6. Cup gas check (*e*). 7. Pressure cylinder (*f*). 8. Blank plug (*h*), to be used when pressures are not taken.

Tools.—1. Hexagonal wrench (bronze) (*B*). 2. Hexagonal wrench (steel) (*D*). 3. Gas-check inserting tool (*A*). 4. Hand pliers (*C*).

The fixed crusher gauge (small) has the same parts and tools, except there is no closing screw cap and no steel hexagonal wrench. (Plate II.)

INTERNAL CRUSHER GAUGE (LARGE)—PLATE III.

Parts.—1. Housing (*a*). 2. Closing screw cap (*g*). 3. Piston (*b*). 4. Washer (*c*). 5. Cylinder holder (*d*). 6. Cup gas check (*e*). 7. Pressure cylinder (*f*).

Tools.—1. Hexagonal wrench (*B*). 2. Pin wrench (*D*). 3. Gas-check inserting tool (*A*). 4. Pliers (*C*).

The internal crusher gauge (small) has the same parts and tools, except a screw-driver is substituted for the pin wrench. (Plate IV.)

Plate V shows the gauges for verifying dimensions of parts of crusher gauges.

Plate VI shows an internal crusher gauge, similar to that shown on Plate IV, which has been recently designed for use in the smaller mountain guns, etc., the area of the piston being $\frac{1}{30}$ instead of $\frac{1}{10}$ inch; the small-arms pressure cylinder, 0.20 inch diameter, being used in it, instead of the cannon pressure cylinder, 0.25 inch diameter.

METALS USED.

The housings of the large gauges are made from Sanderson's bar steel No. 6, double-extra hammered and unannealed; the pistons, closing screw caps, cylinder holders, and all the steel parts of the small gauges from Hobson's choice extra best bar steel; the blank plug of the fixed crusher gauges from machinery steel, and the cup gas checks and washers from sheet copper. The pressure cylinders

are made from copper alloy of the approximate proportions of 93 parts copper to 7 of zinc. The rod is drawn once after annealing, and every precaution in composition and treatment is taken to have the metal homogeneous.

TESTS OF METAL.

The steels are of standard brands and are subjected to the usual tests and inspections upon their receipt at the arsenal. The sheet copper is inspected for thickness and general appearance. Before accepting a lot of metal intended for pressure cylinders samples are furnished to Watertown Arsenal, where, in a testing machine, they are subjected to compression. If the results are sufficiently uniform the lot of metal is accepted. From these results a table of pressures and lengths is compiled for use with the cylinders made from that particular lot of metal.

INSTRUCTIONS FOR USE OF INTERNAL CRUSHER GAUGE FOR CAN- NON, LARGE.

Ten copper washers, three cylinder holders, one hundred cup gas checks, and pressure cylinders as required, are ordinarily furnished with each gauge, and a micrometer for measuring the length of pressure cylinders, to each post.

The pressure cylinders are subjected to initial compression. For most firings cylinders initially compressed to 18,000, 28,000, and 32,000 pounds per square inch will be found sufficient. Accompanying each lot of pressure cylinders is a pressure table from which the pressures corresponding to the shortening of the cylinders after firing may be found.

There are also required for use a number of small wooden boxes, numbered, and a record book. The form of record is appended.

Where much firing is done and great accuracy sought, it is desirable that the post be furnished with standard gauges for verifying the diameter and length of the piston and the diameter of the piston seat or bore of gauge.

TO PREPARE THE GAUGE.

Remove the closing screw cap, holding the gauge fast with the hexagonal wrench and unscrewing with the pin wrench. Push the piston out with the gas-check inserting tool. Thoroughly clean piston and bore of gauge with dry cotton waste and oil.

Examination will be made to determine if the piston enters the bore freely at both ends; should this not be the case the gauge should be sent to Frankford Arsenal for inspection and correction.

The parts of the gauge being in order, put a drop of oil on each end of piston and insert piston in bore. Take the pressure cylinder which is to be used in recording the pressure, and enter it in the

cylinder holder until it is held in the middle of its length. Seize the end of the pressure cylinder with the hand pliers and place it in the gauge resting on the piston head and supported *axially* by the cylinder holder at its middle. Screw in the cap, first taking the precaution to see that a copper washer has been placed under head of cap. The cap should be screwed in tightly, holding the gauge with the hexagonal wrench and using the pin wrench.

Place a copper cup gas check in the bore above the piston (bottom of cup next to piston), and with the gas-check inserting tool set it down on piston until there is no play between the piston head and pressure cylinder underneath, which now remains firmly held between piston head and closing screw cap.

INSERTION OF GAUGE IN CARTRIDGE BAG.

Cut a circular hole in the middle of the bottom of the bag. The diameter of the hole should be somewhat less than that of the gauge. Place the gauge in the bottom of the bag and slip the closed end through the opening made, the piston end of gauge being within the bag. Tie the cartridge bag tightly in the grooves of the gauge, using that part of the bottom of the bag immediately about the opening so that no powder can pass between gauge and bottom of bore of gun. Several turns of strong twine in the grooves will be found necessary to properly secure the gauge. With small cartridge bags it is sufficient to tie along lower groove of gauge. Fill in the powder and complete cartridge as ordinarily.

MANIPULATION OF GAUGE AFTER FIRING.

After firing, dip gauge into a bucket of water to remove fouling, then wipe dry. Unscrew the cap, using wrenches as before; remove the pressure cylinder with its cylinder holder by means of the hand pliers and push piston out with gas-check inserting tool. Release the cylinder from cylinder holder, wipe it clean, place it in its proper box, and return it to the officer in charge of the gauges.

The piston and bore should be cleaned and oiled as previously described before each round.

When standard verifying gauges are on hand they should be used constantly for examination instead of the piston. A new cup gas check should be used, if necessary, at each fire.

SELECTION OF PRESSURE CYLINDERS AND EMPLOYMENT OF COMPRESSION TABLES.

In selecting the cylinders to be employed with any given charge of powder, care should be taken to use those, if on hand, whose *initial compression* is nearest to, but below, the probable pressure. For example, if a pressure of about 27,000 pounds be expected, a cylinder having an initial compression of 18,000 pounds should be employed. If a pressure over 30,000 pounds but less than 32,000

pounds be expected, a cylinder having an initial compression of 28,000 pounds should be used. Some margin between the initial compression and probable pressure ought to be allowed, however, since if the pressure should be equal to or below the initial compression no record may be obtained. In case this occurs, a cylinder of lower initial compression should be used for the next round. Similarly, if the recorded pressure be much higher than anticipated, it will be desirable to use a pressure cylinder of higher initial compression than the one first employed.

MEASUREMENT OF PRESSURE CYLINDERS.

As cylinders of the same degree of initial compression may vary slightly in length, in any particular experiment employ those which after careful selection and measurement are found to be of nearly the same length, or differ by less than a thousandth of an inch.

The length of the pressure cylinder should be carefully measured with the micrometer before firing, holding the cylinder lightly in the micrometer without squeezing it, and a record made of the reading and the number of the box in which the cylinder is placed. After firing, its length is again measured and the difference between the two readings obtained. Entering, in the table, a column of "corrected sets" at the head of which is the range of pressures beginning with the "initial compression" as an origin, pass down the column until is found the "corrected set" nearest the reduction determined in the length of the pressure cylinder. The corresponding pressure will be found at the left of the table and on the same line; closer approximation may be found by interpolation.

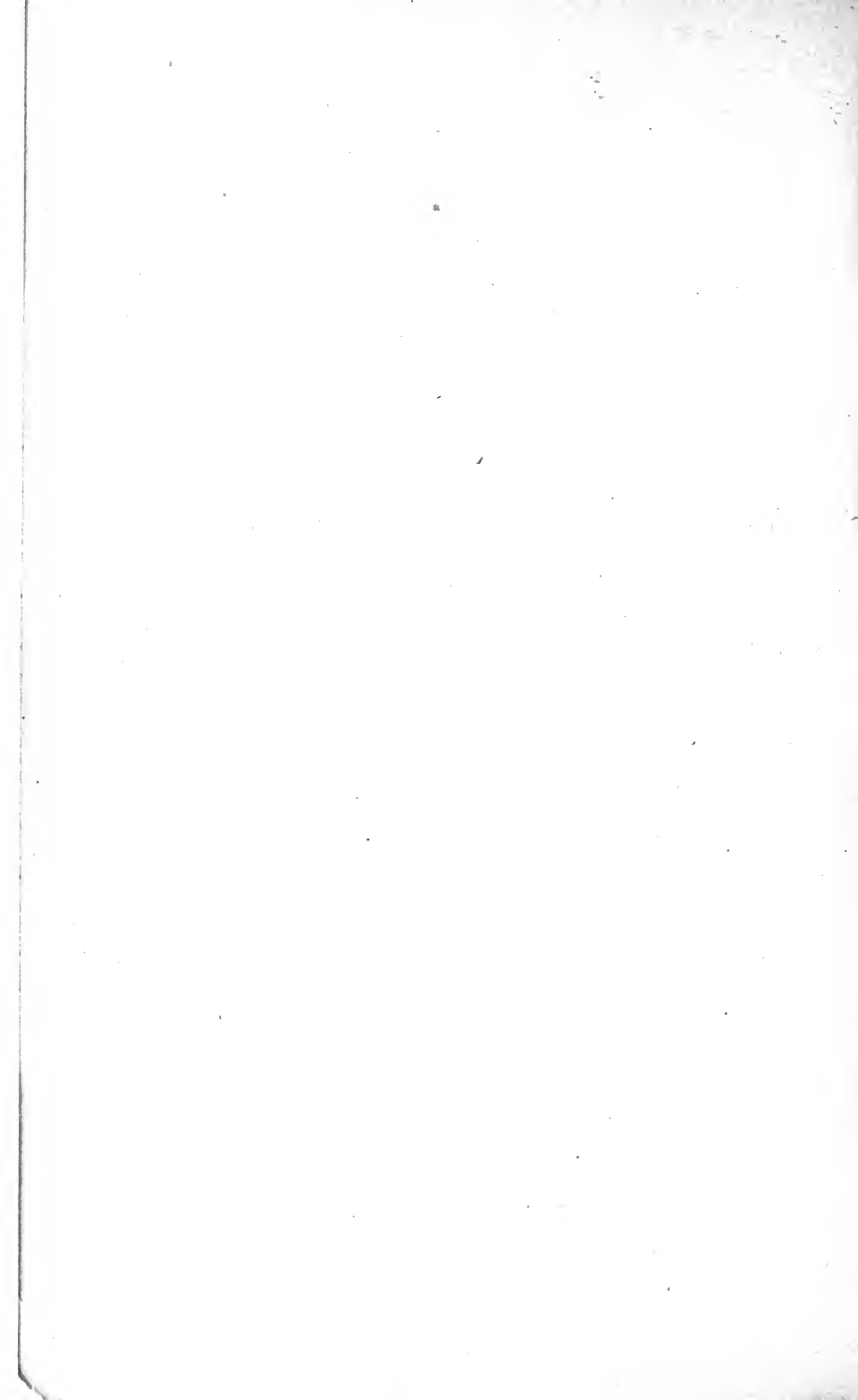
Extract from Record Book.

Box	28	29	30
Length under 32,000 pounds.....	.3650	.3655	.3651
Length after firing.....	.3390	.3397	.3400
Compression.....	.0260	.0258	.0251
Pressure.....	36,665	36,620	36,460
Gauge.....	No. 1.	No. 1.	No. 1.
Gun.....	3.2" B. L. rifle.	3.2" B. L. rifle.	3.2" B. L. rifle.
No. of round.....	1,213	1,214	1,215
Date	August 26, 1890.	August 26, 1890.	August 26, 1890.
Loading	{ 3 $\frac{3}{4}$ lbs. I. K. H. 13-lb. projectile.	{ 3 $\frac{3}{4}$ lbs. I. K. H. 13-lb. projectile.	{ 3 $\frac{3}{4}$ lbs. I. K. H. 13-lb. projectile.

PRICE LIST OF CRUSHER GAUGES, TOOLS, AND ACCESSORIES FOR CANNON.

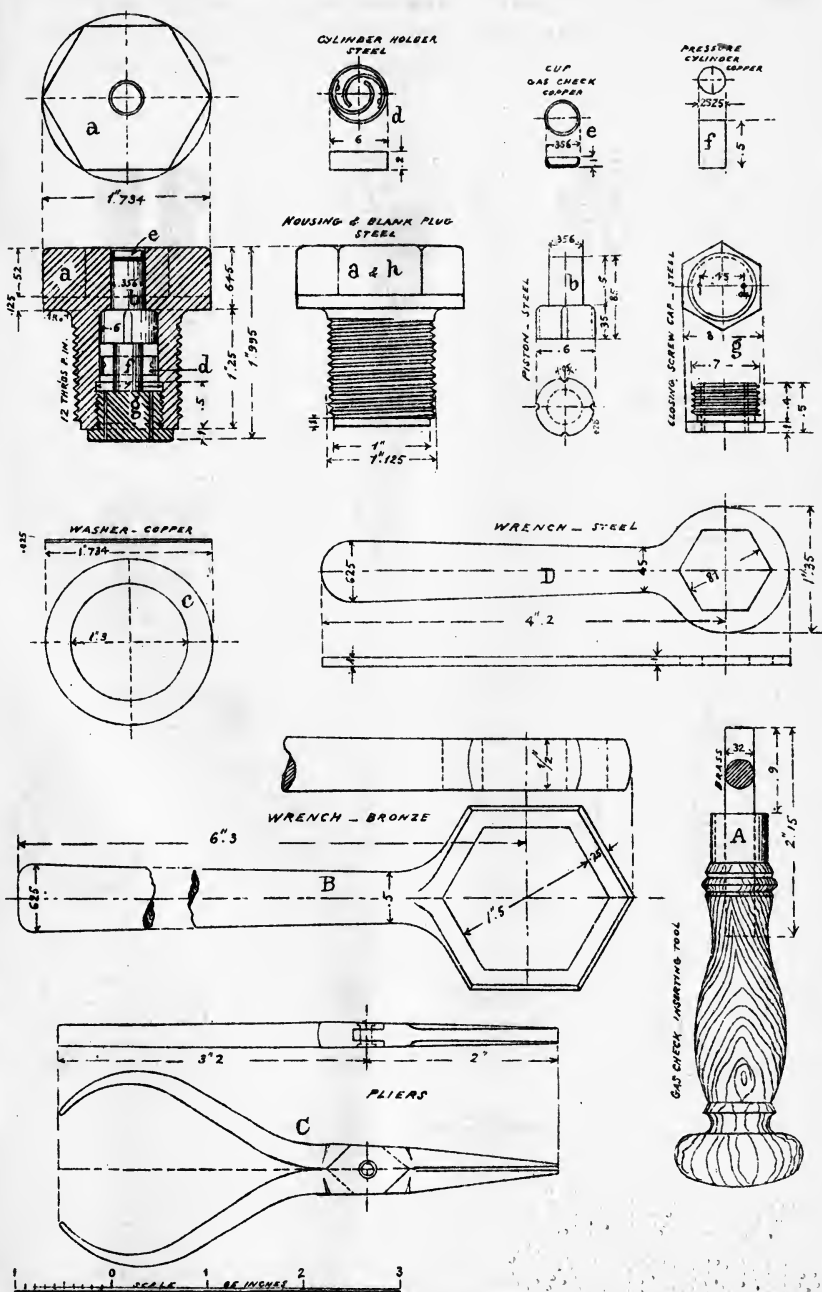
Fixed crusher gauge for cannon, large.....	each..	\$10.00
Blank plugs for fixed crusher gauge, cannon, large*.....	do...	3.00
Fixed crusher gauge for cannon, small.....	do...	5.50
Blank plugs for fixed crusher gauge, cannon, small*.....	do...	1.50
Internal crusher gauge for cannon, large	do...	10.00
Internal crusher gauge for cannon, small:		
$\frac{1}{10}$ -inch piston.....	do...	5.00
$\frac{1}{80}$ -inch piston.....	do...	4.75
(Cost of tools, except gas check and cylinder, same for both).		
Cylinder holders, steel.....	do...	.75
Cylinder holders, rubber	per 1,000..	20.00
Gas-check cups:		
For $\frac{1}{10}$ -inch piston.....	do...	5.00
For $\frac{1}{80}$ -inch piston.....	do...	1.00
(Cost of tools, etc., same for both.)		
Copper washers, large.....	do...	30.00
Copper washers, small.....	do...	25.00
Pressure cylinders for cannon, 0.25 inch diameter.....	do...	22.50
Pressure cylinders for small arms, 0.2 inch diameter	do...	20.00
Hexagonal wrench, bronze, large	each..	.50
Hexagonal wrench, bronze, small.....	do...	.40
Hexagonal wrench, steel	do...	.25
Spanner-pin wrench, bronze	do...	.40
Screw-driver wrench, steel	do...	.25
Small flat-nose pliers.....	do...	.25
Gas-check inserting tool.....	do...	.27
Micrometer	do...	3.50
Box to contain gauge, tools, etc.....	do...	1.60
Gauges for verifying dimensions of crusher gauges.....	per set..	25.00

* To protect seat of gauge when latter is not used.



Fixed Crusher Gauge for Cannon-large

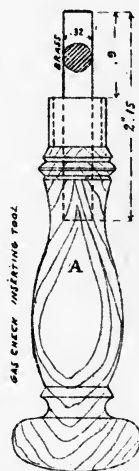
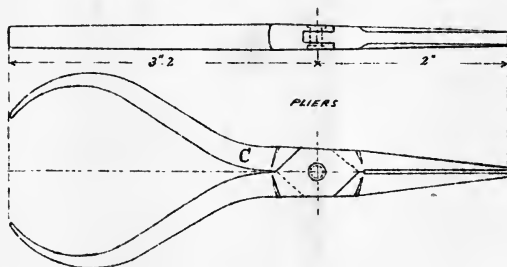
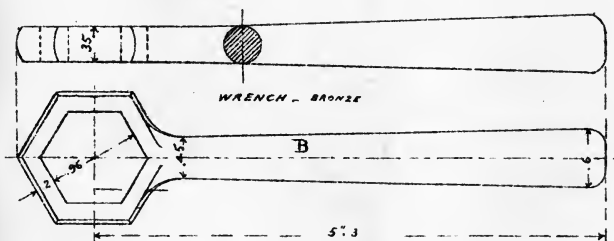
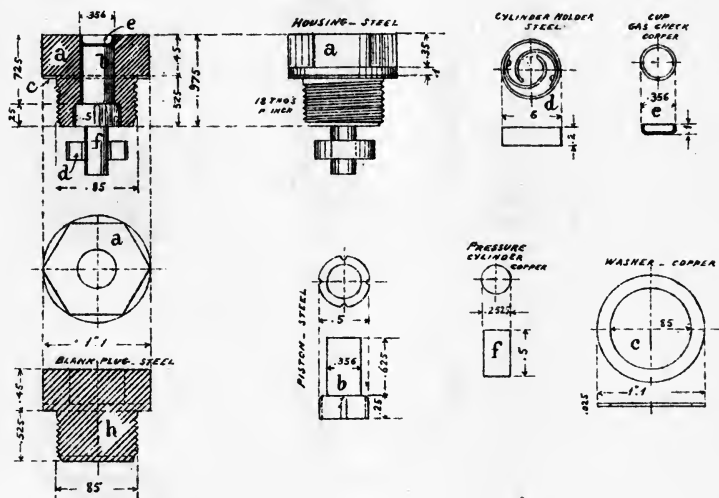
USE - FOR SEA COAST B. L. GUNS



10 1000
1000000000

Fixed Crusher Gauge for Cannon - small

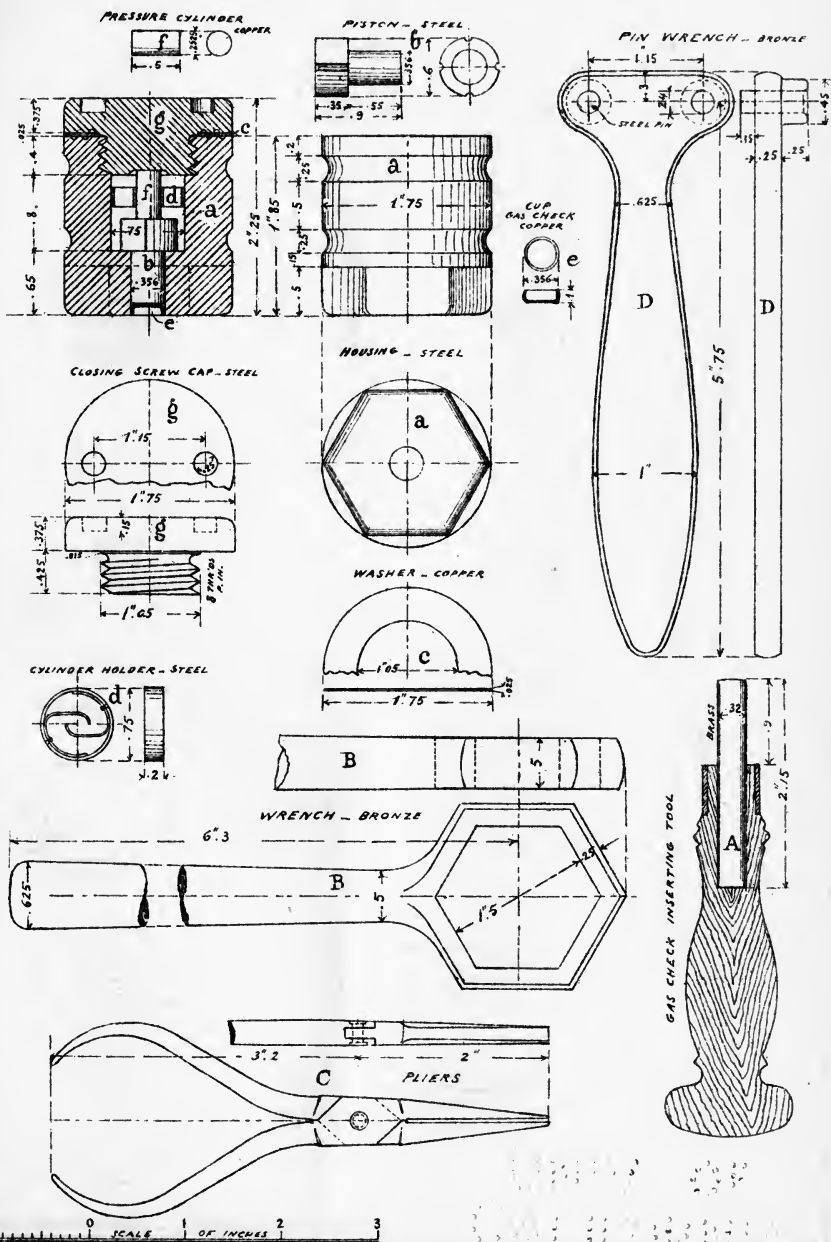
USE { FOR B. L. FIELD GUNS WITH RADIAL VENT AND FOR 5 INS.
AND 7 INS. SIEGE GUNS - THE GAUGE BEING SEATED IN
HEAD OF BREECH BLOCK SPINDLE



70 VIML
AUGUST 1960

Internal Crusher Gauge for Cannon - large.

USE { FOR M. L. CANNON OF LARGE CALIBRE IN GENERAL AND CHIEFLY (AT PRESENT)
FOR ARTILLERY POSTS WITH SMOOTH BORE GUNS - MAY ALSO BE USED IN B. L.
GUNS OF LARGE CALIBRE IN LIEU OF FIXED GAUGE.

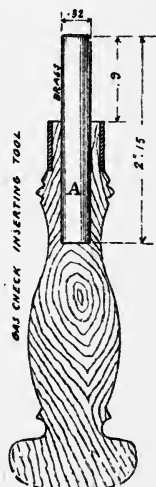
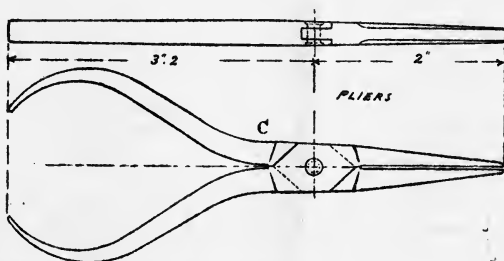
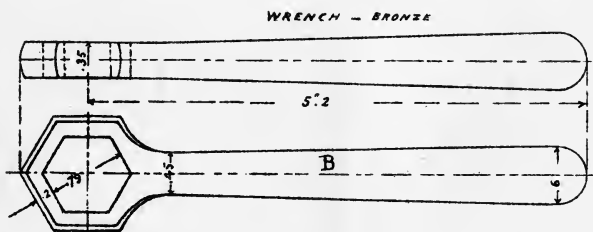
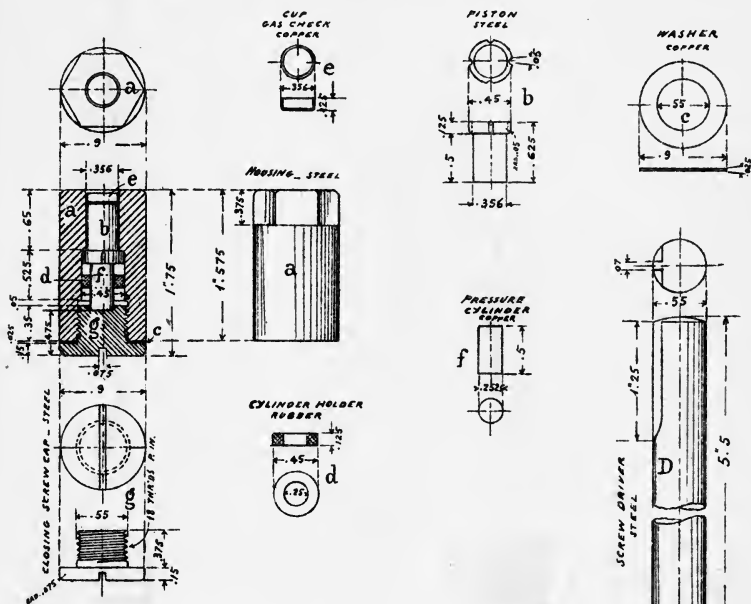


1881

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Internal Crusher Gauge for Cannon - small

USE { FOR B.L. FIELD GUNS AND MORTARS - ESPECIALLY THOSE WITH AXIAL VENT IN WHICH FIXED GAUGE CANNOT BE SEATED - MAY ALSO BE USED FOR 5 AND 7 INCH B.L. SIEGE PIECES IN PLACE OF FIXED GAUGE - AND FOR M.L. FIELD PIECES IN GENERAL



INTERNATIONAL HYPODERMIC

No. 1000
 Made in U.S.A.
 Patent Pending

HYPODERMIC

HYPODERMIC

HYPODERMIC

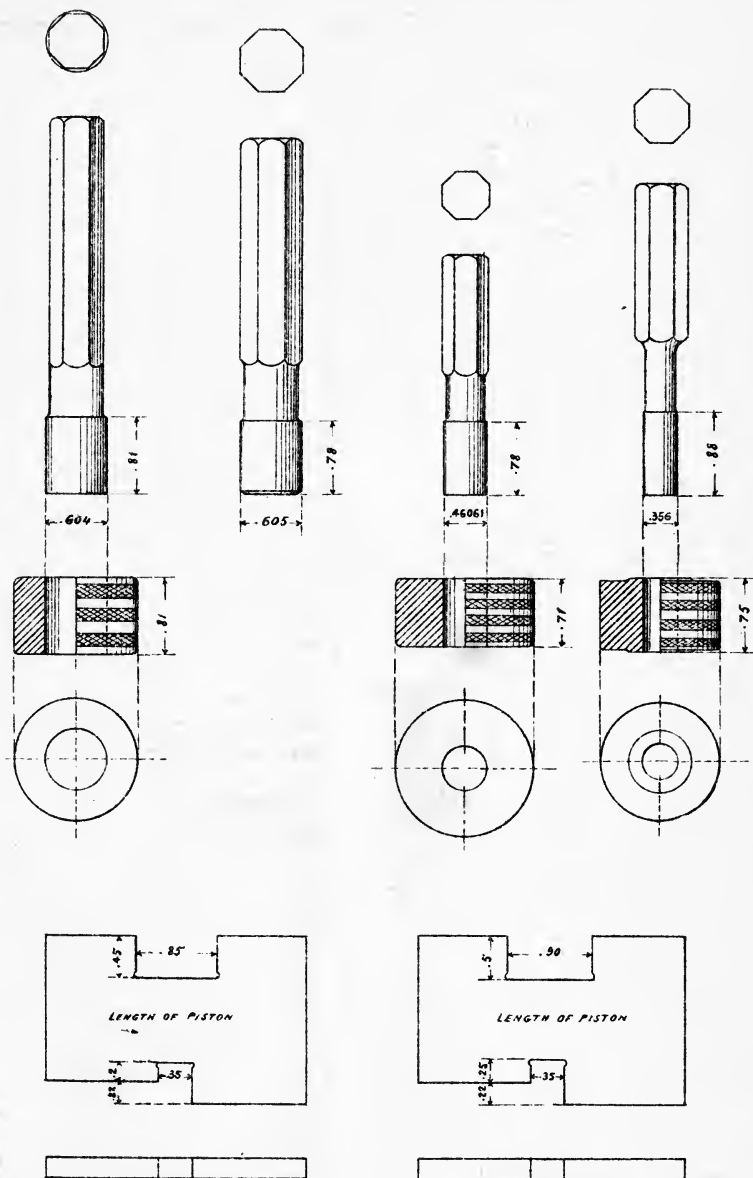
HYPODERMIC

HYPODERMIC



HYPODERMIC
 PATENT PENDING

Gauges for verifying dimensions of Parts of Crusher Gauges



Given by the State of New York
to the State of New York

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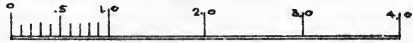
4

5

6

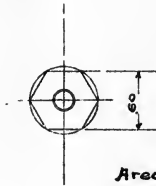
THE STATE OF NEW YORK
IN SENATE
JANUARY 18, 1890

Internal Crusher Gauge for 1.6 Inch Gun.

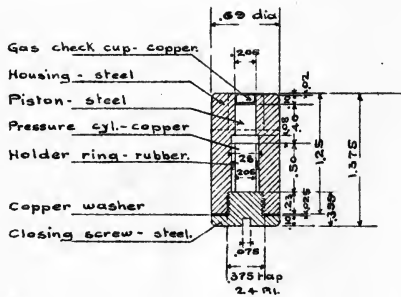


Frankford Arsenal, Mar. 26. 1901.

Henry Beach
Major Ordnance Dept.
Commanding.



Area of Piston $\frac{1}{30}$ Sq. in.



Internal Control System

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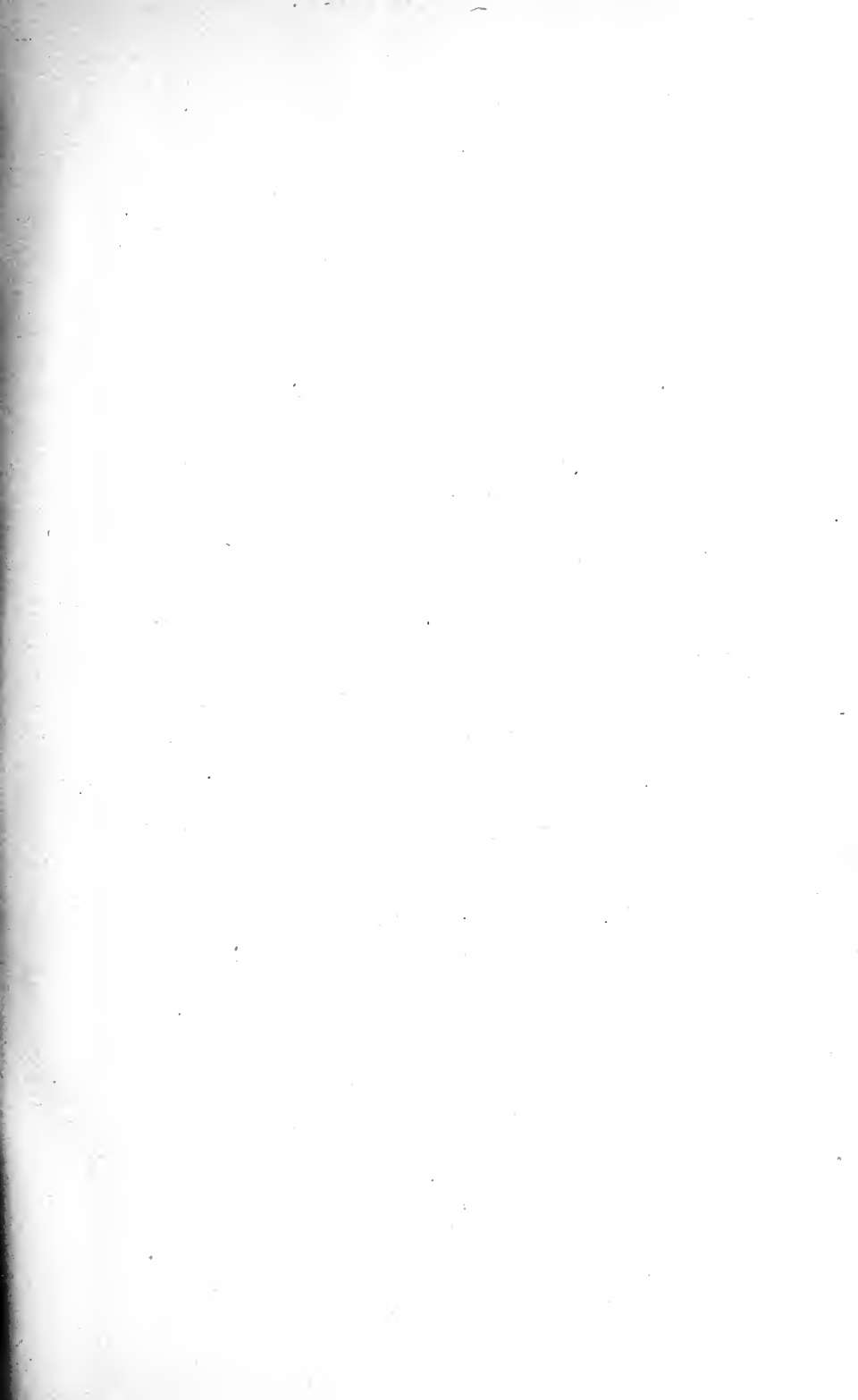
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